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ABSTRACT

Eighty-two 5 to 8 year old children (I.Q. range 79-120) exhibiting learning disabilities were divided equally into three groups on the basis of their Wechsler Intelligence Scale for Children Verbal I.Q. (VIQ) and Performance I.Q. (PIQ) scores: a high performance-low verbal group, a verbal equal to performance group, and a high verbal-low performance group. The three groups were equated for age and Full Scale I.Q. The performance of these subjects on selected measures of verbal, auditory perceptual, visual perceptual, problem solving, motor, and psychomotor abilities did not yield the same clear cut differences observed in previous studies with older (9 to 14 year old) children with learning disabilities who had been divided into groups on the basis of VIQ-PIQ discrepancies of an identical magnitude. The results of this study argue for very guarded clinical interpretation of VIQ-PIQ discrepancies of this magnitude in the case of younger children with learning disabilities. (Author)

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Abstract

Eighty-two 5- to 8-year old children (I.Q. range 79-120) exhibiting learning disabilities were divided equally into three groups on the basis of their WISC Verbal I.Q. and Performance I.Q. scores: a high performance-low verbal group, a verbal equal to performance group, and a high verbal-low performance group. The three groups were equated for age and Full Scale I.Q. The performance of these subjects on selected measures of verbal, auditory-perceptual, visual-perceptual, problem-solving, motor, and psychomotor abilities did not yield the same clear-cut differences observed in previous studies with older (9- to 14-year-old) children with learning disabilities who had been divided into groups on the basis of VIQ-PIQ discrepancies of an identical magnitude. The results of this study argue for very guarded clinical interpretation of VIQ-PIQ discrepancies of this magnitude in the case of younger children with learning disabilities.

The Significance of WISC Verbal-Performance Discrepancies for Younger Children with Learning Disabilities[1]

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Introduction

The psychological significance of discrepancies between Verbal I.Q. (VIQ) and Performance I.Q. (PIQ) on the WISC has been the focus of a number of studies (e.g., Belmont & Birch, 1966; Coleman & Rasof, 1963; Graham, 1952; Holroyd, 1968; Reed, 1967; Rourke & Telegdy, 1971; Rourke, Young, & Flewelling, 1971). Such investigations have usually involved a division of groups of subjects into those with a high VIQ (HV) and a low PIQ (LP), those with a high PIQ (HP) and a low VIQ (LV) and, occasionally, those with equal or nearly equal VIQ and PIQ.

One rather consistent finding in these studies is that children with VIQ-PIQ discrepancies favouring PIQ did relatively poorly on language- and school-related tasks, especially reading. For example, Coleman and Rasof (1963) showed that under-achievers did relatively poorly on most WISC verbal subtests and relatively well on most WISC performance subtests, and Holroyd (1968) found that children whose VIQ-PIQ discrepancy was such that VIQ was 25 points lower than PIQ had more problems in speech, hearing and/or reading than did controls.

In an attempt to define some of the developmental parameters of reading, Reed (1967) used a 10-point discrepancy between WISC VIQ and PIQ to separate children into HV-LP and HP-LV groups; his third group (V=P) had no difference between VIQ and PIQ. With WISC FSIQ introduced as a covariate, the groups of younger children (CA, 6 years) did not differ in reading achievement. However, there was a significant relationship between reading achievement and VIQ-PIQ discrepancies for older children (CA, 10 years), with the HV-LP group performing at a level superior to that of the HP-LV group. (For the purposes of the present study, it is important to note that Reed's younger and older groups did not perform in a similar fashion.) In another study, Rourke et al. (1971) used a method similar to Reed's (1967) for composing three groups of 9- to 14-year-old children with learning disabilities. The groups were equated for age and FSIQ. The results of the Rourke et al. (1971) study indicated that the performance of the HV-LP group was clearly superior to that of the HP-LV group on most measures of verbal abilities (e.g., reading, spelling) and auditory-perceptual skills (e.g., speech sounds discrimination). In addition, the HP-LV group performed at a level clearly superior to that of the HV-LP group on tasks that primarily involved visual-perceptual skills (e.g., visual memory, spatial visualization). A V=P group performed at a level roughly intermediate to that of the other two groups over all but two of the 12 dependent measures employed. Within the limitations resulting from the controls for I.Q. level and range in these studies, the results of the Reed (1967) and Rourke et al. (1971) investigations lent support to the contentions of Graham (1952) and Belmont and Birch (1966) who had suggested that, in older children, the VIQ-PIQ relationship may be a more important consideration with regard to reading difficulties than is general intelligence.

In order to determine the lateralizing significance of VIQ-PIQ discrepancies in older children with learning disabilities, Rourke and Telegdy (1971 employed groups composed in a fashion identical to that of Rourke et al. (1971) and

assessed their performance on 25 measures of motor and psychomotor abilities. Their results indicated clear superiority of the HP-LV group on most measures of complex motor and psychomotor abilities, regardless of which hand was employed in performing the tasks. These differences did not, in general, obtain in the case of tasks which required less complex motor and psychomotor abilities. In addition, although expectations involving differential hand superiority of the HP-LV and HV-LP groups were not supported, the results were considered to be consistent with the view that WISC VIQ-PIQ discrepancies reflect the differential integrity of the two cerebral hemispheres in older children with learning disabilities.

The present study was designed as a developmental extension of the Rourke et al. (1971) and Rourke and Telegdy (1971) investigations. It was carried out in order to determine if patterns of relationships similar to those obtained for groups of older children with learning disabilities would be in evidence for similarly-composed groups of younger children. For several reasons, a clear-cut pattern of differences such as that obtained in the Rourke et al. (1971) and Rourke and Telegdy (1971) was not anticipated. These reasons include Reed's (1967) failure to find significant differences in reading between his HV-LP and HP-LV groups of younger (6-year-old) children, the lower reliability of WISC VIQ and PIQ measures in younger subjects (Wechsler, 1949), and the lower WISC reliability coefficients in children with learning disabilities as compared to normals (Coleman, 1963). Additionally, in the present sample there was probably a high percentage of brain-damaged children, a group which has been shown to exhibit relatively high levels of variability (Czudner & Rourke, 1971; Reitan, 1971; Rourke & Czudner, 1971).

Method

Subjects. The 82 right-handed male subjects were selected from a group of

350 children with learning disabilities in the age range of 5-8 years who had received an extensive battery of neuropsychological tests administered by experienced technicians. Three groups were formed on the basis of the relationship between their VIQ and PIQ scores on the WISC. Group 1 (HP-LV) consisted of 34 subjects whose PIQ was at least 10 points higher than their VIQ; Group 2 (V=P) consisted of 28 subjects with VIQ and PIQ within 4 points of each other; and the members of Group 3 (HV-LP) were 20 subjects who had VIQ values at least 10 points higher than their PIQ. All subjects fell within a WISC FSIQ range of 79-120. The three groups were equated for age and FSIQ.

Measures. The tests used can be divided into two categories, viz.: (1) the verbal, auditory-perceptual, visual-perceptual, and problem-solving tests similar to those employed in the Rourke et al. (1971) study; and (2) the motor and psychomotor tests similar to those employed in the Rourke and Telegdy (1971) investigation. The tests in the first category were as follows: the Peabody Picture Vocabulary Test (PPVT) (Dunn, 1965), an estimate of verbal intelligence based upon a measure of recognition vocabulary; the Reading, Spelling, and Arithmetic sub-tests of the Wide Range Achievement Test (WRAT) (Jastak & Jastak, 1965); Reitan's modification of the Halstead Category Test for younger children (CT) (Reitan & Heineman, 1968), a measure of non-verbal problem solving ability; the first 30 items of the Halstead Speech Perception Test (SPT) as modified by Reitan for older children (Reitan & Heineman, 1968), a measure of the ability to perceive spoken stimulus sounds through hearing and to relate the perception through vision to the correct configuration of letters on a multiple-choice form; the Seashore Rhythm Test (SRT) (Reitan & Heineman, 1968) which involves alertness, sustained attention to the task, and the ability to discriminate subtle differences in rhythmic patterns; the Target Test (TT) (Reitan, 1971), a measure of visual memory

involving the ability to reproduce graphically a pattern previously pointed out by the examiner. The tests in the second category were as follows: strength of grip, as measured by the Smedley Hand Dynamometer; the Maze Test of kinetic tremor (Mazes) (Kløve, 1963; Knights & Moule, 1968); the Graduated Holes Test of static tremor (Holes) (Kløve, 1963; Knights & Moule, 1968); the Peg-board Test (Pegs) (Kløve, 1963; Knights & Moule, 1968), a measure of speed and accuracy of hand-eye coordination; a measure of speed of finger tapping (Knights & Moule, 1967; Reitan & Heineman, 1968); a measure of speed of foot tapping (Knights & Moule, 1967); and the Tactual Performance Test (TPT) as modified for younger children (Reitan, 1971), a measure of nonvisual psychomotor and somesthetic abilities.

Results

The means and standard deviations for age and the VIQ, PIQ, and FSIQ on the WISC for subjects in each of the three groups are presented in Table 1. Comparisons of the means for the control variables of age and WISC FSIQ indicated no significant differences among the three groups. Table 1 also contains the raw score means and standard deviations for the three groups on all of the dependent measures, the p values for the one-way analyses of variance, and the p values for the individual group comparisons as suggested by Winer (1962, pp. 65-69). The principal comparisons of interest are those between the HV-LP and the HP-LV groups (i.e., those contained in the column labelled 3 vs. 1). These may be considered to be orthogonal comparisons. The remaining differences (i.e., those contained in the columns labelled 2 vs. 1 and 3 vs. 1) are not orthogonal and should be interpreted accordingly. The number of subjects in each group was as noted above except in the case of the SPT and SRT. The number of subjects used in the analysis of the SPT for the HP-LV, V=P, and HV-LP groups was 23, 22, and 13, respectively; for the SRT 30, 26,

and 19, respectively.

Insert Table 1 about here

One-way analyses of variance carried out for each of the dependent measures yielded significant F ratios in two instances: WRAT Reading ($p < .05$) and SPT ($p < .10$). Individual comparisons favouring the performance of the HV-LP group over that of the HP-LV group were significant in three cases: WRAT Reading ($p < .01$), SPT ($p < .05$), and WRAT Spelling ($p < .10$). Individual comparisons favouring the performance of the HP-LV group over that of the HV-LP group were significant in three instances: Mazes, right-handed time ($p < .05$), Pegs, right-handed time ($p < .10$), and TPT, right-handed time ($p < .10$).

To make comparisons clearer, all data were converted into standardized T scores. These data are represented graphically in Figures 1 and 2. The T scores have been adjusted so that good performance is represented in one direction (above 50) and poor performance is represented in the opposite direction (below 50). Figures 3 and 4 are graphic representations of the performance of 9- to 14-year-old groups on dependent measures similar to those employed in the present study. Figure 3 is adapted from the Rourke et al. (1971) study; Figure 4, from Rourke and Telegdy (1971).

Insert Figures 1, 2, 3, and 4 about here

Inspection of Figures 1 and 3 reveals a similar pattern of performance for younger and older children on the verbal, auditory-perceptual, visual-perceptual, and problem-solving tasks. In contrast, the performance of younger children on the motor and psychomotor tasks (Figure 2) did not resemble that obtained for older children (Figure 4).

Discussion

In contrast to the findings of Rourke et al. (1971) and Rourke and Telegdy (1971), there were few significant differences between the performances of the three groups in the present investigation. Those differences which were obtained should be interpreted with caution because of the high probability of significant differences emerging by chance when such a large number of comparisons are carried out.

Nevertheless, the pattern of group differences on the PPVT, WRAT, SPT, SRT, CT, and TT (see Figure 1) closely resembled that obtained by Rourke et al. (1971) (see Figure 3). The significant difference favouring the performance of the HV-LP group over that of the HP-LV group on the Reading sub-test of the WRAT appears to contradict the findings of Reed (1967). The performances of Reed's younger HV-LP and HP-LV groups did not differ significantly on a measure of reading achievement when WISC FSIQ was introduced as the covariate. However, Reed used the Gates Primary Paragraph Recognition Test as his measure of reading achievement. This test may very well reflect different abilities than does the WRAT Reading sub-test, which is essentially a measure of word recognition. Also, it should be pointed out that Reed's younger subjects (at a mean age of 6 years, 6 months) were an average of one full year younger than the subjects used in the present study. Because of the presumed difference in the length of exposure to reading instruction attendent upon such an age differential, the children in the present investigation may not have been directly comparable to Reed's younger group.

There were a number of other findings, the implications of which should be mentioned. (1) The significant difference favouring the performance of the HV-LP group over that of the HP-LV group on the SPT was probably due to the superior reading skills of the HV-LP group, since one of the requirements of

the SPT is to read the three alternative answers in order to underline the correct alternative. (2) The absence of significant differences on the SRT was probably a reflection of the fact that this test is too difficult for children in this age group, as suggested by Reitan and Heineman (1968); the mean number of errors for the three groups in the present study would seem to represent no significant deviation from chance. (3) That no significant inter-group differences were found on the younger children's version of the CT confirms the findings of previous studies (e.g., Knights & Tymchuk, 1968; Rourke et al., 1971) that no significant differences should be expected on the CT when groups of subjects are equated for FSIQ. (4) The absence of significant inter-group differences on the great majority of the motor and psychomotor measures may be a reflection of a general lag in sensory-motor development in younger children with learning disabilities, as proposed by Kephart (1960). (5) A comparison of the raw score means and standard deviations reported by Rourke et al. (1971) and Rourke and Telegdy (1971) with the results of the present study suggests that, in general, the younger children exhibited greater variability in performance than did the older subjects. In the present sample of children, there was probably a high incidence of cerebral dysfunction. As mentioned above, high levels of variability have been found to characterize the performance of younger brain-damaged children (e.g., Czudner & Rourke, 1971; Reitan, 1971; Rourke & Czudner, 1971). Thus, the results of the present study, in this respect, were quite consistent with these latter findings. (6) Finally, samples of children with learning disabilities similar to that employed in the present study have been shown to exhibit lower WISC reliability coefficients than do normals (Coleman, 1963). This problem of reliability is further compounded by the relatively lower reliability of VIQ and PIQ measures in younger subjects (Wechsler, 1949).

These factors, together with the high level of variability mentioned in (5) above (which is one principal reason for low reliability), and the aforementioned high probability that the significant differences obtained may have been due to chance, should serve to caution the clinician in his interpretation of WISC VIQ-PIQ discrepancies of this magnitude in younger children with learning disabilities. As a case in point, it is clear that the present results, unlike those obtained by Rourke and Telegdy (1971) in their investigation of similarly-composed groups of older children, do not support the view that such discrepancies reflect the differential integrity of the two cerebral hemispheres in younger children with learning disabilities.

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Footnote

1. This study was presented at the meeting of the Ontario Psychological Association, Toronto, February, 1971. It was assisted under Grant No. 195 of the Ontario Mental Health Foundation and funds provided by the Research Division, I.O.D.E. Regional Children's Centre, Windsor, Ontario.

Table 1

Means and Standard Deviations for Age, WISC VIQ, PIQ, FSIQ and for Scores on all Tests, p Levels for the Analyses of Variance and for the Comparisons Among the Three Groups

		Group 1 HP-LV (n=34)	Group 2 V=P (n=28)	Group 3 HV-LP (n=20)	ANOVA p	Comparisons Between Groups 3 vs. 1 p	2 vs. 1 p	3 vs. 2 p
Age months	M	89.2	89.4	87.6				
	SD	9.1	11.0	11.3				
VIQ	M	91.1	97.7	107.8				
	SD	10.5	7.7	10.6				
PIQ	M	107.9	98.4	92.3				
	SD	9.6	7.1	12.7				
FSIQ	M	99.0	98.0	100.4				
	SD	10.0	7.6	12.7				
PPVT	M	99.7	102.4	101.9				
	SD	13.5	12.2	13.7				
WRAT								
Reading (centiles)	M	31.5	34.5	50.1	.05	.01		.05
	SD	24.3	24.5	30.5				
Spelling (centiles)	M	30.3	35.3	39.0		.10		
	SD	18.4	19.9	24.1				
Arithmetic (centiles)	M	37.3	37.1	44.7				
	SD	19.2	20.2	26.7				
SPT* (correct)	M	13.7	15.2	18.6	.10	.05		
	SD	6.1	6.7	6.6				
SRT* (errors)	M	13.6	13.4	13.0				
	SD	6.5	6.1	8.4				

(Table 1 Continued)

CT (errors)	M	22.8	23.2	22.1	
	SD	11.5	12.7	13.8	
TT (correct)	M	11.5	9.7	10.3	.10
	SD	4.3	3.7	4.5	
Dynamometer Right Hand (R) (kgs)	M	10.0	9.8	10.1	
	SD	2.7	2.6	2.3	
Left Hand (L) (kgs)	M	9.3	9.0	9.7	
	SD	2.6	2.6	2.3	
Mazes R time (secs.)	M	7.6	8.2	10.5	.05
	SD	5.4	5.0	8.3	
R counter (errors)	M	50.0	54.8	54.9	
	SD	27.3	28.9	33.8	
R speed (secs.)	M	103.8	107.4	103.7	
	SD	26.3	29.4	23.1	
L time (secs.)	M	14.6	13.7	15.3	
	SD	8.4	8.6	8.4	
L counter (errors)	M	83.0	73.4	81.5	
	SD	31.6	37.2	30.1	
L speed (secs.)	M	97.7	105.9	97.5	
	SD	30.6	21.1	23.0	
Holes R time (secs.)	M	4.1	4.5	5.1	
	SD	3.5	3.4	5.3	
R counter (errors)	M	24.0	33.6	31.0	.10
	SD	15.8	21.0	28.3	
L time (secs.)	M	10.8	8.4	9.4	
	SD	16.2	5.2	10.0	
L counter (errors)	M	36.4	41.2	45.2	
	SD	21.4	22.6	31.1	

(Table 1 Continued)

Pegs					
R time	M	41.1	47.4	47.9	.10
(secs.)	SD	12.5	23.6	16.6	
L time	M	45.2	54.5	52.5	
(secs.)	SD	19.7	35.8	19.0	
Tapping					
R hand	M	27.3	27.3	26.0	
(number)	SD	5.0	5.7	4.4	
L hand	M	24.8	25.2	24.0	
(number)	SD	4.6	5.6	5.7	
R foot	M	22.3	24.2	22.8	
(number)	SD	5.4	5.2	6.6	
L foot	M	21.9	22.0	21.4	
(number)	SD	5.5	4.3	6.6	
Total	M	96.2	98.7	95.7	
(number)	SD	17.2	16.6	21.7	
TPT					
R time	M	6.4	7.0	8.7	.10
(secs.)	SD	4.1	3.9	3.8	
L time	M	4.5	3.9	4.5	
(secs.)	SD	3.7	2.3	1.9	
Both time	M	2.1	2.4	2.6	
(secs.)	SD	1.4	2.0	1.7	
Total time	M	13.1	13.0	15.7	
(secs.)	SD	8.0	7.0	6.4	
Memory	M	3.2	3.7	3.1	
(correct)	SD	1.5	2.0	1.4	
Location	M	1.9	2.0	2.1	
(correct)	SD	2.1	1.5	1.7	

* analyzed using partial data only

Figure Captions

Figure 1. Mean T scores for each group on the verbal, auditory-perceptual, visual-perceptual, and problem-solving tasks.

Figure 2. Mean T scores for each group on the motor and psychomotor tasks.

Figure 3. Mean T scores for each group on the verbal, auditory-perceptual, visual-perceptual, and problem-solving tasks. (Adapted from Rourke, et al., 1971).

Figure 4. Mean T scores for each group on the motor and psychomotor tasks. (Adapted from Rourke & Telegdy, 1971).

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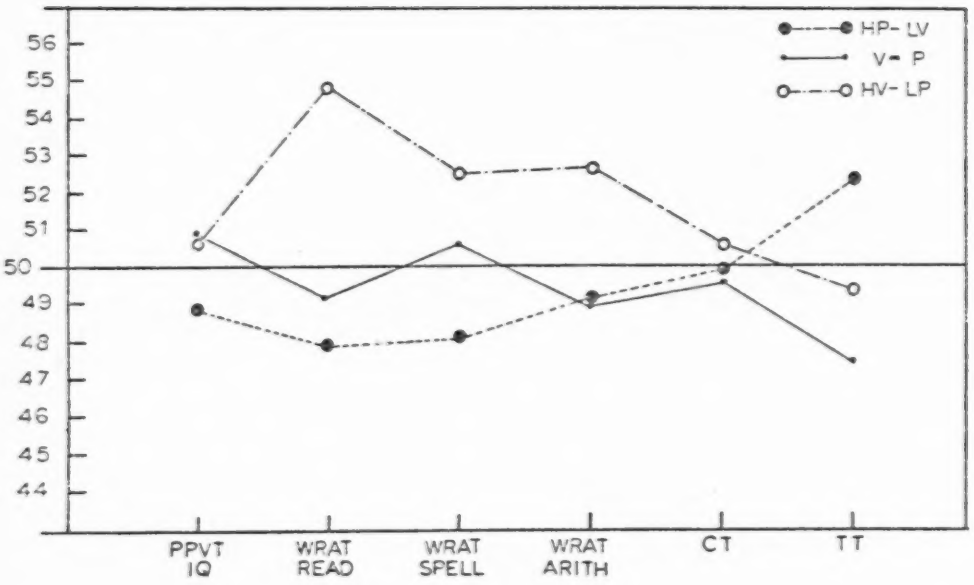

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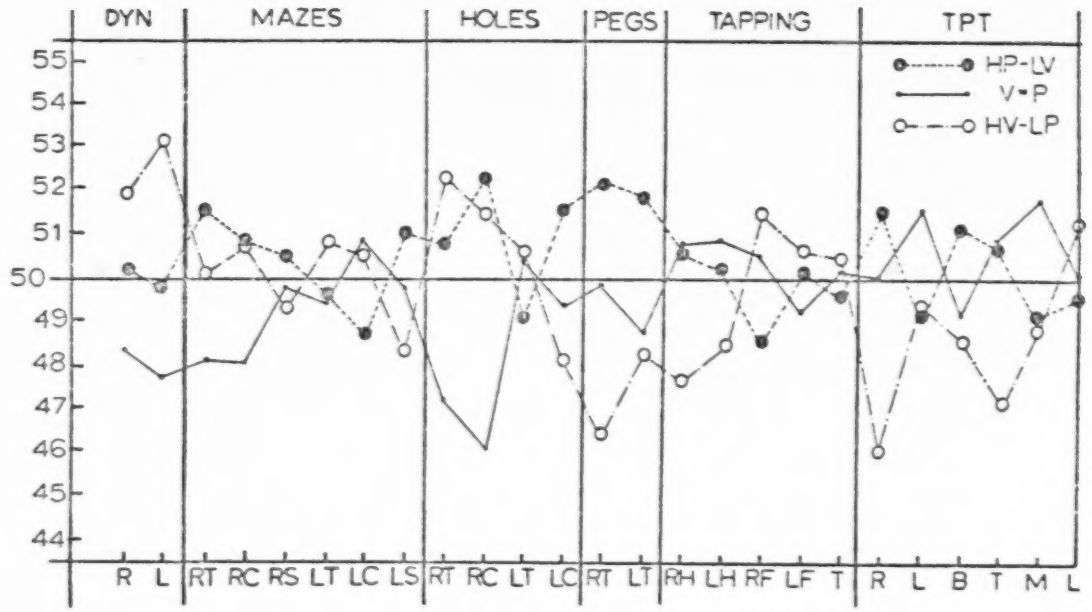

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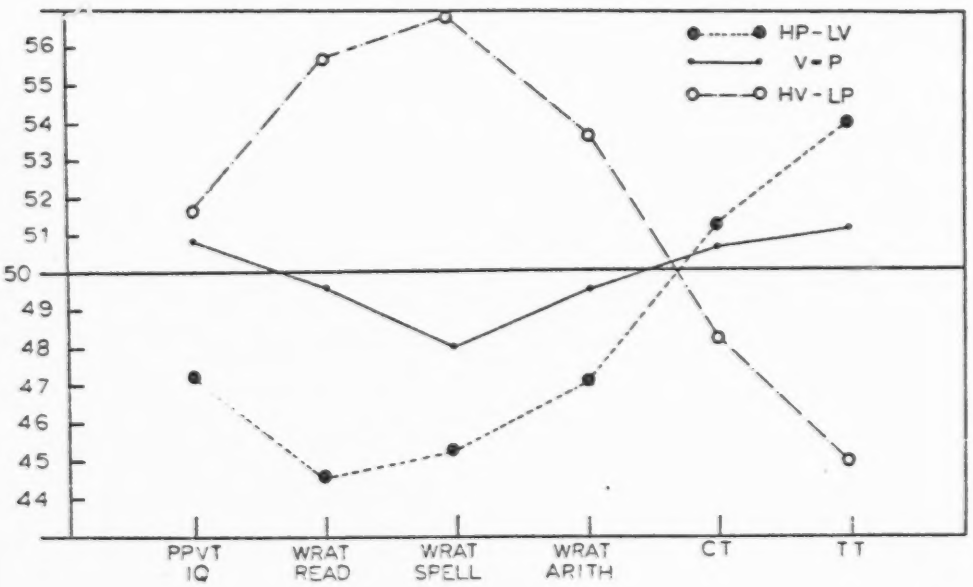

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